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ANTHONY A. BARRETTO ET AL

Serial No. 10/827,557 (TI-33631.1)

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For: SUBSTRATE ALIGNMENT METHOD AND APPARATUS

Art Unit

Examiner

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10-4-04

Jay M. Cantor, Reg. No. 19,906

PRELIMINARY AMENDMENT

Sir:

In response to the Notice of Omitted Item(s) dated June 30, 2004, and the Decision on Petition dated September 7, 2004 attached hereto are pages 2, 4, and 17 which are identical to the pages so numbered in the parent application. Please add these pages in their proper order into the specification as filed. No new matter has been added.

Respectfully submitted,

Jay M. Cantor

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substrates are not lying perfectly horizontal because they may not be fully seated within depressions built into the tray designed to hold the substrates. When the substrate is not fully horizontal with respect to the vacuum pickup the chances of the vacuum pickup being able pick up the substrate goes
5 down. Should a substrate not be picked up, intervention is often required to fix the positioning of the substrate to permit the vacuum pickup to attach to the substrate.

[0004] Intervention is not desired in an efficient packaging process since it often requires stopping the packaging process and a human operator making
10 the required adjustments. Intervention slows down the process and increases overall production costs.

[0005] Solutions using custom designed substrate trays can reduce the number of substrates that are not lying horizontally, but they typically require a special tray for each size and type of substrate. This increases the costs and
15 overhead associated with the packaging process, especially in packaging plants that process a wide variety of different substrates.

[0006] Therefore, a need has arisen for a method and apparatus that can increase the probability of a vacuum pickup forming a solid bond with a substrate by ensuring that the substrates are lying horizontal with respect to
20 the vacuum pickup.

[0009] The present invention provides a number of advantages. For example, use of a preferred embodiment of the present invention reduces the probability of requiring intervention in a packaging process by reducing the chance of a substrate not being picked up by a vacuum pickup down to almost zero. The net result is an increase in productivity.

[0010] Also, use of a preferred embodiment of the present invention incurs no additional cost during normal packing operations. The only costs incurred involve the creation of a plate used to lift the substrates.

10 BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The above features of the present invention will be more clearly understood from consideration of the following descriptions in connection with accompanying drawings in which:

[0012] Figures 1a and 1b provide a top-down and side view of a substrate tray designed to hold substrates;

[0013] Figures 2a-c provide views of a vacuum pickup attempting to pick up substrates where some of the substrates are not lying flat in the substrate tray;

[0014] Figures 3a-d provide views of a vacuum pickup picking up substrates with use of an apparatus for ensuring that the substrates are flat when

9. An apparatus for lifting substrates in a semiconductor packaging process, the apparatus comprising:

a plate with a plurality of protrusions;

5 a substrate tray with a plurality of depressions and a hole in each depression coupled to the plate, the substrate tray to hold a substrate in each depression;

a lifting device with a plurality of vacuum pads coupled to the substrate tray, the lifting device to attach to the substrates and lift the substrates out of the substrate tray;

10 a first actuator coupled to the plate, the first actuator to raise and lower the plate; and

a second actuator coupled to the flipping device, the second actuator to lower and raise the lifting device.

15 10. The apparatus of claim 9, wherein the protrusions are flat at their tops.

11. The apparatus of claim 10, wherein the protrusions are rectangular in cross section.

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